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(54) Cleaning tool for a root canal

(57) The cleaning tool (10) consists of a head section (12) and an adjacent cleaning section (14) with a shaft (20) whose jacket surface is provided with bristles (22). The shaft (20) along with the bristles (22) is designed as a single piece so that the cleaning tool (10) can be used to reliably clean in particular the root canal or a dental interstice.

[column 1]

Specification

Background of the Invention

[0001] The invention relates to a cleaning tool for a root canal and a dental interstice, with a head section and an adjacent cleaning section, which has a shaft whose jacket surface is provided with bristles. The invention also relates to a method for manufacturing a cleaning tool for a root canal, which has a head section and an adjacent cleaning section with a shaft whose jacket surface is provided with bristles.

[0002] Cleaning tools of this kind are used in dental treatments after the root canal of a tooth has been prepared with a corresponding evacuation or drilling tool.

[0003] The object of cleaning is to remove the material left behind in the root canal after evacuation, so that the root canal can be subsequently filled.

[0004] In conventional cleaning procedures, a rinsing solution is introduced into the root canal, which is intended to entrain and remove the remaining material. However, this does not ensure that material that has accumulated at the end of the root canal or in the apical quarter will also be rinsed out of the root canal.

[0005] Alternatively or additionally, root canals can be cleaned with rotating, so-called "drilling" tools. However, not every root canal has a circular cross section, so that not all areas of the root canal can be cleaned with such tools.

[0006] Brushes for cleaning cavities and drillings in teeth are known, wherein bristles consisting of twisted wires are worked in. However, these brushes are generally too large for cleaning a root canal. In addition, the twisted wires can become drilled open as the brush rotates, and bristles can become detached and remain behind in the root canal.

Object of the Invention

[0007] The object of the invention is to provide a cleaning tool and a method with which the aforementioned disadvantages can be overcome, and in particular the root canal can be reliably cleaned.

Solution according to the Invention

[0008] This object is achieved according to the invention with a cleaning tool of the kind mentioned at the outset, in which the shaft along with the bristles is

designed as a single piece. In addition, the object is achieved with a method mentioned at the outset, in which the shaft along with the bristles is manufactur d out of one piece.

[0009] The cleaning section of a cleaning means described at the outset must be designed in such a way that the shaft securely holds the bristles, and the rotational motion of the head section of the cleaning tool is simultaneously transmitted up to the cleaning section tip. Because the shaft can hence not be significantly twisted while cleaning, it is given a relatively stiff design.

[0010] By contrast, the bristles cannot damage the root canal wall. They must abut to the wall and adapt to it. Bristles are hence made out of a relatively soft material, or very finely designed with a small diameter.

[0011] Despite these considerations, the shaft and bristles are designed as a single piece, which means that they are designed as a single work piece, i.e., generally made out of one material. The advantage here is that the bristles are bonded significantly better to the shaft. As a result, they do not become detached while cleaning.

[0012] In addition, the bristles can be given nearly any shape desired, and do not have to be incorporated into twisted wires. Manufacturing becomes easier and cheaper. Further, the bristles can be especially small, designed as so-called micro-bristles, which is not possible in conventional manufacturing processes for brushes used to clean dental orifices, since very small bristles immediately become detached from the set of twisted wires.

[0013] The bristles as a whole can yield nearly any brush design desired. For example, a cleaning brush can also be given an oval cross section.

[0014] In order to make the shaft sufficiently stiff, it can be comparatively thick in design, because the bristles can be made especially short according to the invention.

[0015] As a whole, the cleaning section of the cleaning tool according to the invention can have a smaller diameter than conventional brushes. This makes the cleaning tools extremely well suited for cleaning root canals. In comparison to conventional rinsing procedures, they yield a significantly better cleaning result.

Advantageous Further Developments of the Invention

[0016] In an advantageous further development of the cleaning tool according to the invention, the shaft along with the bristles is fabricated in a milling procedure, in particular a micro-milling procedure. Since milling is an abrasive procedure,

th bristles can b given a sharp edge with this procedure, so that they clean especially well. In addition, the bristles can be given any shape desired. Milling is preferred when using relatively rigid or stiff base material.

[0017] Alternatively or additionally, the shaft and bristles can be manufactured in a casting procedure, in particular a microinjection casting procedure. This type of procedure is particularly inexpensive. It makes sense especially when using relatively soft base material, since it fills out the entire mold especially well during the casting process, i.e., in particular bristle cavities of the mold.

[0018] To increase the torsional and flexural rigidity of the shaft of the cleaning tool according to the invention, it can advantageously be provided with a core made out of a reinforcing material, in particular metal. The cleaning section of the tool according to the invention is usually made out of plastic. A rod made out of metal, e.g., titanium or high-grade steel, fiberglass or plastic can be cast into it either in a preceding step or during the actual micro-casting procedure. Particularly suitable plastics are polypropylene, polystyrene or elastomers. Such plastics are suitable in particular because the bristles do not detach from the shaft, i.e., do not tear off, and are also soft enough to adapt to the contour and surface of the root canal. The core situated in the shaft also facilitates the attachment of a head section, which can either have a handle, or be provided for insertion into a drill.

[0019] To achieve an optimal cleaning effect accompanied by a high stability of the cleaning section, the bristles as a whole comprise an essentially conical exterior. This shape ensures that power is routed from the head section of the cleaning tool to the tip of the cleaning section without the shaft twisting significantly. At the same time, the bristles have to adapt relatively little to the evacuated root canal, which usually tapers at least incrementally. The conical exterior advantageously has a diameter of 0.4 mm to 2.0 mm at the head section, and a diameter of 0.1 mm to 1.0 mm at the tip. The bristles are advantageously designed as round bristles with a diameter of 0.01 mm.

[0020] The cleaning tool according to the invention evacuates material from the root canal particularly well if the bristles are distributed over the jacket surface of the shaft in a helical pattern. The cleaning tool then conveys material like a drill, but without enlarging the root canal. By properly selecting the hardness, shape and position of the bristles, the cleaning effect can be specifically tailored to existing requirements. In this case, various cleaning zones with differently shaped bristles or bristles made out of various materials can be distributed over the shaft.

[column 4]

[0021] To improve the cleaning result even more, the bristles are coated in advantageous further developments of the cleaning tool according to the invention. In particular, they are provided with an abrasive material or chemically active agent, e.g., a lubricant or a disinfectant.
[0022] The bristles are advantageously inclined at least partially relative to the longitudinal axis of the shaft, so that the cleaning tool can also be used to remove material at the end of the root canal, i.e., in the apical quarter. In particular, bristles at the tip of the shaft project from it essentially in the direction of its longitudinal axis.

Brief Description of Drawing

[0023] An exemplary embodiment of a cleaning tool according to the invention will be explained in greater detail below based on the attached drawing. Shown on:

Fig. 1 is a longitudinal section through an exemplary embodiment of a cleaning tool according to the invention.

Detailed Description of the Exemplary Embodiment

[0024] A cleaning tool 10 shown on Fig. 1 has a head section 12 and an adjacent cleaning section 14. The cleaning tool 10 is used to remove material that has remained behind in a root canal after the root canal has been evacuated using a drilling or scraping tool. In addition, the cleaning tool 10 can also be used to clean areas of the root canal that cannot be cleaned with drilling tools. The cleaning tool 10 on Fig. 1 is not shown to scale, but in highly shortened form for better visualization.
[0025] The head section 12 is essentially made with a sleeve 16 that can be clamped into a drill chuck of a drilling or cleaning device (not shown). In an alternative exemplary embodiment (not shown), the head section 12 has a handle with which the cleaning tool 10 can be manually introduced into a root canal and moved, in particular rotated, therein.
[0026] A core 18 designed as a metal rod made out of titanium is situated in the sleeve 16. The sleeve 16 and core 18 are connected via an interference fit. Alternatively or additionally to such a non-positive connection, a form-fitting bond can be provided, e.g., by providing the upper end section of the core 18 as shown on Fig. 1 with a multi-edged profile.

[0027] The core 18 is designed as a cylindrical rod, i.e., it has essentially the same diameter over its entire length. In the exemplary embodiment shown, the diameter measures 0.08 mm. As an alternative, the diameter can advantageously measure about 0.05 mm to 0.8 mm.

[0028] The core 18 extends into an essentially conical shaft 20, which symmetrically envelops the core 18. The upper end of the core as shown on Fig. 1 has a diameter D of 0.4 mm, while the opposing end has a diameter d of 0.1 mm. The shaft 20 is provided with a tapering of about 0.04 mm per mm of length in the longitudinal direction. In alternative exemplary embodiments (not shown), the tapering measures from about 0.02 mm per mm of length in the longitudinal direction up to 0.06 mm per mm of length in the longitudinal direction.

[0029] The shaft 20 is made out of plastic, which is cast around the core 18 in a microinjection molding procedure. This creates a permanent bond between the core 18 and shaft 20. Polypropylene was used in this exemplary embodiment.

[0030] In one exemplary embodiment (not shown), the core 18 is slightly conical, wherein the tapering end area of the cone is at the end of the core 18 opposite the head section 12. Such a conically designed core 18 is easier to bend at the tapering end area than at the head section 12. As it enters into and cleans the root canal, the shaft 20 therefore adapts more easily to the shape of the root canal at its rear section, where the root canal is usually curved.

[0031] The jacket surface of the conical shaft 20 accommodates bristles or naps 22, which are arranged along a helical line shown by a dashed line on Fig. 1. The bristles 22 project essentially perpendicular from the jacket surface of the conical shaft 20. They are about 0.05 mm long, and have a diameter of 0.01 mm. In alternative exemplary embodiments (not shown), the bristles 22 are 0.02 mm to 0.2 mm long.

[0032] At the lower end of the shaft 20 as shown on Fig. 1, i.e., at the end opposite the head section 12, the shaft 20 accommodates bristles 22a and 22b, which also point in the direction of the longitudinal axis of the shaft 20.

[0033] The cleaning tool 10 is clamped into the mentioned drilling device, and introduced into a previously evacuated root canal while rotating. In this case, the bristles 22a and 22b interact with the bristles 22, and together they transport even material from the apical section of the root canal to the outside.

[0034] The bristles 22, 22a and 22b were manufactured along with the shaft 20 in a single microinjection molding procedure. The bristles 22, 22a and 22b are therefore permanently bonded with the shaft 20.

[0035] At the same time, the bristles 22, 22a and 22b are soft enough in design to readily adapt to the root canal wall.

[0036] In one exemplary embodiment of the cleaning tool 10 (not shown), the shaft 20 of the cleaning section 14 is cylindrical, and the bristles 22 it accommodates generate a conical shape roughly corresponding to the conical shape shown on Fig. 1. In such a cleaning tool 10, the bristles 22 are especially long particularly in the section located near the head section 12. At the same time, the shaft 20 is also particularly thin in this section. A cleaning tool 10 designed in this way can therefore also be introduced into especially narrow root canals. The comparatively long bristles 22 also readily adapt to the wall of such a narrow root canal.

[0037] In order to further enhance the cleaning effect of the cleaning section 14, the bristles 22, 22a and 22b are coated with an abrasive material. Alternatively or additionally, a lubricant and/or disinfectant can be applied to the bristles 22, 22a and 22b.

Reference List

[0038]

10	Cleaning tool
12	Head section
14	Cleaning section
16	Sleeve
18	Core
20	Shaft
22	Bristles
22a	Bristle at tip
22b	Bristle at tip
D	Diameter at head section
d	Diameter at tip

[column 6 cont.]

Claims

1. Cleaning tool (10) for a root canal or dental interstice with a head section (12) and adjacent cleaning section (14), which has a shaft (20) whose jacket surface is provided with bristles (22),
characterized in that the shaft (20) along with the bristles (22) is designed as a single piece.

2. Cleaning tool according to Claim 1,
characterized in that the shaft (20) along with the bristles (22) is fabricated in a milling procedure, in particular a micro-milling procedure.

3. Cleaning tool according to Claim 1 or 2,
characterized in that the shaft (20) along with the bristles (22) is fabricated in a casting procedure, in particular a microinjection molding procedure.

4. Cleaning tool according to one of the preceding claims,
characterized in that the shaft (20) has a core (18) made out of a reinforcing material, in particular metal.

5. Cleaning tool according to one of the preceding claims,
characterized in that the bristles (22) as a whole comprise an essentially conical exterior of the cleaning section (14).

6. Cleaning tool according to one of the preceding claims,
characterized in that the bristles (22) are distributed over the jacket surface of the shaft (20) in a helical pattern.

7. Cleaning tool according to one of the preceding claims,
characterized in that the bristles (22) are coated, in particular with an abrasive material or chemically active agent, like a cleanser, disinfectant and/or lubricant.

8. Cleaning tool according to one of the preceding claims,
characterized in that the bristles (22) are inclined at least partially relative to the longitudinal axis of the shaft, in particular, that bristles (22a, 22b) at the tip of the shaft (20) project from it essentially in the direction of the longitudinal axis of the shaft (20).

9. Method for manufacturing a cleaning tool for a root canal, which has a head section (12) and adjacent cleaning section (14) with a shaft (20) whose jacket surface is provided with bristles (22),
characterized by the step of manufacturing the shaft (20) along with the bristles (22) from a single piece.

10. Method according to Claim 9,
characterized in that fabrication involves milling the shaft (20) along with the bristles (22), in particular micro-milling.

11. Method according to Claim 9,
characterized in that fabrication involves casting the shaft (20) along with the bristles (22), in particular microinjection molding.

Fig.1